PRINTEK®

Innovative Business Printing Solutions

MtP400 Series

Programmer's Manual

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TABLE OF CONTENTS

Acknowledgements ..... **ii**

Introduction **1**
- Printer Models and Key Features 1
- Manual Contents 1

Selecting Emulations **3**

Printek Emulation **5**
- Introduction 5
- Control Codes and Escape Sequences Grouped by Function 6
  - Communications 6
  - Character Size and Line Spacing 7
  - Character Attributes 9
  - Character Sets 9
  - Horizontal Position 10
  - Vertical Position 10
  - Bar Codes 12
  - Graphics 16
  - Storing and Printing Graphic Images and Logos 18
  - Black Mark Sensing 19
    - Black Mark Requirements 19
    - Black Mark Sensing Commands 21
  - Gap Sensing 22
  - Printer Controls 23
  - Printer Status Commands 24
  - Magnetic Card Reader 27
- Control Code and Escape Sequence Summary 29

Mt3 Emulation **31**

O'Neil Emulation **33**

ZPL-II Emulation **37**

Hex Dump Mode **39**

Print & Font Samples **41**

ASCII Character Tables **45**
- ASCII Control Code Definitions 45
- Decimal to Hexadecimal TO ASCII Conversion Table 46

Printer Reset Conditions **47**

Glossary **49**

Introduction

This manual is intended to be used by software developers for the purpose of creating and/or modifying applications to make use of the special features offered by the Printek MtP series of mobile thermal printers.

This section of the manual describes the various models of printers and the features supported by this manual and the information contained in other sections.

For printer set up and operating information for users, system integrators and information technology personnel, please refer to the *MtP400 Series Operator's Manual* for the specific model of interest.

Printer Models and Key Features

Printek's MtP400 series of mobile thermal printers offers solutions for a wide variety of printing applications. The various models support flexible paper widths, printing from roll stock or flat stock in easy loading cassettes, label printing enhancements, and several host interface choices. The configuration options are shown below for each model. For additional information, please refer to the *MtP400 Series Operator's Manual* or visit www.printek.com.

Model	Max Paper Size	Label Printing	Host Interfaces			
			RS-232	IrDA	Bluetooth	Wi-Fi
MtP400	4.125" Roll	Front Black Mark	Std	Opt	Opt	Opt
MtP400 LP	4.125" Roll	Front/Back Black Mark, Gap	Std	Opt	Opt	Opt
MtP400 SL	4 x 6" Cassette	n/a	Std	Opt	Opt	Opt

Manual Contents

The remaining sections of this manual provide information on printer commands offered for the various emulations as well as additional information helpful to programmers. Descriptions of each section are shown below.

Selecting Emulations describes which emulation is available for each printer and how to select emulations in the MtP400 series printers.

Printek Emulation describes in detail the commands available for controlling Printek MtP400 series printers.

Mt3 Emulation provides a summary of the command that are supported when emulating a Printek Mt3 printer.

O'Neil Emulation provides a summary of the commands that are supported when emulating an O'Neil microFlash4t printer.

ZPL-II Emulation provides a summary of the commands that are supported when emulating a Zebra ZPL-II compatible printer.

Hex Dump describes the printer's output while in Hex Dump mode, and how it may be used to debug software problems.

Print & Font Samples provides character set mapping information and several font print samples.

ASCII Character Tables provides a definition of ASCII control codes and an ASCII to Decimal to Hexadecimal conversion table.

Printer Reset Conditions describes the state of the printer after a power up reset or receipt of a reset command.

Glossary provides a reference for printer related terms.

Selecting Emulations

The emulations offered by Printer Mobile Thermal Printers allow for a great deal of language commonality between the various series of Printek printers as well as compatibility with systems and software that have been created for printers offered by other manufacturers.

The Printek MtP400 series printers offer Printek, O'Neil, and ZPL-II emulations plus a Printek Mt3 emulation to allow the printers to work with existing three inch applications.

In the MtP400 series, the printer's default emulation may be selected through the control panel set up as described in the *MtP400 Series Operator's Manual*. To select an emulation temporarily, the host system may send an escape sequence as described below.

Select Emulation **ESC ESC *n***

This command selects emulation mode *n* by which future commands will be interpreted as described in the following table. The selected mode will be in effect until another Select Emulation command is received or until the printer is reset via an escape sequence appropriate for the current emulation, or the printer is manually reset by entering/exit the front panel set up mode or cycling power on the printer.

Once the emulation has been selected, please refer to the section of this manual that describes the commands available for that emulation.

Example: The following escape sequence will set the printer to Mt3 Emulation.

Escape Sequence: ESC ESC 4
Hexadecimal: 1B 1B 04

n	**Emulation**
0	Test (reserved for factory use)
1	Printek Emulation
2	O'Neil Emulation
3	ZPL-II Emulation
4	Mt3 Emulation
5	Hex Dump Mode
?	Previously Selected Emulation
@	Default Emulation

If more than one emulation has been selected, ESC ESC ? will return to the previously selected emulation. This is particularly useful when the previous emulation is unknown. Please beware that the memory (stack) is only one level deep.

ESC ESC @ will return to the default emulation, as specified by the "Emulation" value in the Interface setup menu.

Note: Numeric values may be specified as either a binary or an ASCII value. As such, the example above may be sent as either 1B 1B 04 or 1B 1B 34.

Printek Emulation

Introduction

This section describes the control codes and escape sequences comprising Printek emulation. This emulation may be selected by setting "Emulation" to "Printek" in the appropriate interface setup menu, or via software with the ESC ESC 1 sequence. While this emulation is selected, control codes and escape sequences from other emulations are not available.

Control codes and escape sequences are used to control printer operation. An ASCII control code is a single character in the range 00 hex through 1F hex, and 7F hex. The ESC (Escape) control code (1B hex) is used to introduce character strings called escape sequences, which provide an extension of the commands available with ASCII control codes.

If a sequence accepts one numeric parameter, it will be represented as "*n*". If a sequence accepts more than one numeric parameter, they will be represented as "*n1 n2 ... nx*".

Spaces are used when documenting escape sequences to increase readability. If a space character is actually a valid part of the sequence, it will be represented as "SPACE". Characters that appear in *italics* (such as "*n*" and "*n1*" above) are not sent to the printer as is; they are used as a place holder indicating that some value must be supplied.

Multiple character strings without intervening spaces typically represent control codes. For example, BS is the Backspace control code (08 hex), not the two characters "B" and "S" (42 and 53 hex), and SPACE is the space character (20 hex). An ASCII Control Code Table is provided on page 45 for your convenience. If you have any doubt about how to interpret a documented control code or escape sequence, refer to the hexadecimal representation in the example. The examples may also be helpful when analyzing a Hex Dump printed by the printer. Please refer to the "Hex Dump " section of this manual on page 39.

Control Codes and Escape Sequences Grouped by Function

Communications

This section describes various methods of controlling the flow of data to and from the printer. Unlike other sections describing printer commands, the descriptions in this section indicate whether the command is one that is "received" by the printer, or "transmitted" by the printer.

Note that some handshaking methods are only supported by the RS-232C Serial interface and are not supported for the IrDA, Bluetooth, or Wi-Fi interfaces.

End of Text (Received by Printer) ETX

If "ETX/ACK" is set to "On" in the Serial Interface Menu (see the *MtP400 Series Operator's Manual*), then processing of an ETX from the printer's input buffer causes the printer to transmit an ACK to the host computer.

Since the ETX may be a legal value within an escape sequence, it is the user's responsibility to ensure that an ETX used for data handshake is not sent within an escape sequence. The user must also ensure that the maximum block size or the number of blocks sent at one time does not exceed the input buffer size of the printer.

The input buffer size is 32K (32,768 Bytes) unless Minimum Buffer has been selected in the printer's Options Menu. Please refer to the *MtP400 Series Operator's Manual* for more information.

Control code: ETX
Hexadecimal: 03

Acknowledge (Transmitted by Printer) ACK

Please refer to the "End of Text" description above.

Control Code: ACK
Hexadecimal: 06

End of Transmission (Transmitted by Printer) EOT

The printer sends an EOT character each time the printer's input buffer becomes empty to indicate the printer is idle.

Control Code: EOT
Hexadecimal: 04

Transmitter On (Transmitted by Printer, Serial Only) XON (DC1)

When transmitted by the printer, this character indicates that the printer is on line and ready to receive data. See DC3/XOFF for more information.

Control Code: XON
Hexadecimal 11

Transmitter Off (Transmitted by Printer, Serial Only) **XOFF (DC3)**

When transmitted by the printer, this character indicates that the printer's input buffer is nearly full and that the host computer should stop sending data. When the printer is able to accept data again, it will transmit DC1/XON.

Control Code: XOFF
Hexadecimal: 13

Character Size and Line Spacing

Select Character Pitch **ESC K *n***

Sets the character pitch according to the following table.

n	Character Pitch /Font	Matrix	Columns Per Line
0	5.5 cpi Sans Serif		
1	10.2 cpi Sans Serif		
2	10.7 cpi Sans Serif		
3	12.7 cpi Courier	16 x 23	52
4	13.5 cpi Courier		
5	14.5 cpi Courier		
6	15.6 cpi Courier		
7	16.9 cpi Courier	12 x 23	64
8	18.5 cpi Courier		
9	20.3 cpi Courier	10 x 23	76
10	22.6 cpi Courier	9 x 23	84
11	25.4 cpi Courier	8 x 23	96

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Example: The following escape sequence will set the printer to use the 12.7 cpi Courier font.

Escape Sequence: ESC K 3
Hexadecimal: 1B 4B 03

Set Printer to 12.7 cpi **SO**

Sets the character size to 12 cpi. This is equivalent to sending ESC k 1.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Control Code: SO
Hexadecimal: 0E

Set Printer to 22.6 cpi — SI

Sets the character size to 22.6 cpi. This is equivalent to sending ESC k 4.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Control Code: SI
Hexadecimal: 0F

Set Printer to 22. 6 cpi — DC4

Sets the character size to 22.6 cpi. This is equivalent to sending ESC k 4.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Control Code: DC4
Hexadecimal: 14

Double High On — FS

Enables double high printing. This will cause the characters and the interline spacing to be doubled in height. Double high printing will be in effect until the Double-High Off (GS) command is received.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Control Code: FS
Hexadecimal: 1C

Double High Off — GS

Disables double high printing.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Control Code GS
Hexadecimal: 1D

Set Text Line Spacing — ESC a *n*

Sets the number of dot rows the paper is to be moved after printing each row of text. Each dot row is 0.125mm. $0 \leq n \leq 10$.

Example: The following escape sequence sets the line spacing to zero (as needed when printing line drawing characters when the PC Line Drawing character set is selected).

Escape Sequence: ESC a 0
Hexadecimal: 1B 61 00

Character Attributes

Select Emphasized Mode — ESC U *n*

Selects emphasized printing mode. Emphasized mode may be used to highlight text by giving it a more bold appearance.

n	Selection
0	Emphasized Mode Off
1	Emphasized Mode On

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Example: The following escape sequence will set emphasized printing mode to On.

Escape Sequence:	ESC	U	1
Hexadecimal:	1B	55	31

Character Sets

Select Extended Character Set — ESC F *n*

Selects the character set to be used when printing extended characters (hexadecimal 80-FF).

n	Character Set
1	International Character Set
2	PC Line Drawing Character Set

When using the PC Line Drawing Character Set, the Text Line Spacing should be set to zero. Doing so will allow the vertical line characters to form continuous lines.

This command must be sent prior to any printable characters on the line. If sent after printable characters are received, a Carriage Return and Line Feed will be inserted and a new line started before the command takes effect.

Please refer to “Print & Font Samples” on page 41 for information on the specific characters contained in each character set.

Example: The following escape sequence will select the International character set.

Escape Sequence:	ESC	F	1
Hexadecimal:	1B	46	31

Horizontal Position

Carriage Return CR

Causes the current line to be printed and the paper to advance to the next line. The current print position is set to the beginning of the next line.

Note that either a Carriage Return (CR) or a Line Feed (LF) will cause both functions to be performed. However, a Carriage Return and Line Feed "pair" (CRLF) will only perform a single line feed.

Control code: CR
Hexadecimal: 0D

Backspace BS

Removes the previous character from the print buffer. Backspacing can be done up to, but not beyond, the beginning of the line.

Control code: BS
Hexadecimal: 08

Horizontal Tab HT

Advances to the next horizontal tab stop. If no tab stop exists between the active column and the right margin, the print position will advance to the beginning of the next line.

Horizontal tab stops are associated with columns, not absolute physical positions. Changing the character spacing or font will change the physical position of the tab stops. Default tab stops are set to every fourth column, i.e. 5,9,13,17,21,25,29,33,37 ….

Control code: HT
Hexadecimal: 09

Vertical Position

Line Feed LF

Causes the current line to be printed and/or advances the paper to the next line. The total distance the paper is advanced is based on the vertical size of the current font plus the Text Line Spacing.

A Carriage Return is also performed which places the current print position at the beginning of the next line.

Note that either a Carriage Return (CR) or a Line Feed (LF) will cause both functions to be performed. However, a Carriage Return and Line Feed "pair" (CRLF) will only perform a single line feed.

Control code: LF
Hexadecimal: 0A

Variable Size Line Feed — ESC J *n*

Causes paper to be moved forward *n* x 0.125mm. $0 \leq n \leq 255$.

A Carriage Return is also performed which places the current print position at the beginning of the next line.

Example: The following escape sequence performs a line feed of five millimeters (5 ÷ 0.125).

Escape Sequence:	ESC	J	40
Hexadecimal:	1B	4A	28

Variable Size Reverse Line Feed — ESC Q J *n*

Causes paper to be moved in the reverse direction *n* x 0.125mm. $0 \leq n \leq 255$.

A Carriage Return is also performed.

Note that reverse paper motion is not supported in MtP400 SL models and this command is ignored.

Example: The following escape sequence moves paper in the reverse direction two millimeters (2 ÷ 0.125).

Escape Sequence:	ESC	Q	J	16
Hexadecimal:	1B	51	4A	10

Vertical Tab — VT

Advances the paper five lines. If a partial line exists in the buffer, that line will be printed including a Carriage Return and Line Feed, and then the paper advanced five lines.

A Carriage Return is also performed which places the current print position at the beginning of the next line.

Control code:	VT
Hexadecimal:	0B

Form Feed — FF

If a partial line exists in the buffer, that line will be printed including a Carriage Return and Line Feed, and then the paper will be advanced as described below.

For printers that use rolls of print media, (MtP400 and MtP400 LP), the paper will be advanced ten lines.

For printers that use cassette media (MtP400 SL), the current sheet of paper will be ejected.

A Carriage Return is also performed which places the current print position at the beginning of the next line.

Control code:	FF
Hexadecimal:	0C

Bar Codes

The MtP400 will automatically print several types barcode symbols using the following command. The specification for each bar code type is also described.

Print Bar Code — ESC *a t n h data*

Printek printers support several bar code symbologies including Code 39, Code 128, UCC/EAN-128, Interleaved 2 of 5, UPC/EAC/JAN, and Codabar. The following table describes the Bar Code command. Details for each specific bar code type, including examples, are found below.

Variable	Value	Description
a	z (lower case)	Print bar code only.
	Z (upper case)	Print bar code and human readable text.
t	1	Code 39
	2	Code 128, UCC/EAN-128
	3	Interleaved 2 of 5
	4	UPC/EAN/JAN
	5	Codabar
n	$1 \le n \le 255$	Number of characters in bar code.
h	$1 \le h \le 255$	Height of bar code in increments of 0.125mm.
data		*n* characters to be represented in the bar code. See individual bar code types for allowable characters and other specific requirements.

Notes: All barcodes are printed with the minimum bar width ("x-dimension") of 0.250mm, in compliance with the respective official specification.
All barcodes are printed centered between the left and right margins. For information on setting margins, please refer to the *MtP400 Series Operator's Manual*.

Code 39 Specifications

Description: Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone.

Character set: 43 ASCII characters including A-Z (uppercase only), 0-9, . (period), - (dash), $, /, +, %, and SPACE

Elements per symbol: 9 (5 bars, 4 spaces)

Character density: 6.25 CPI

Bar width: 0.25mm (narrow to wide ratio = 1:3)

Example: The following escape sequence will print a bar code containing the characters "CODE-39" 1 mm high followed by human readable text.

Escape Sequence:	ESC	Z	1	7	8	C	O	D	E	-	3	9
Hexadecimal:	1b	5A	31	07	03	43	4F	44	45	2D	33	39

Code 128 Specifications

Description:	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone.
Character set:	256 ASCII via three Code Sets and an "Extend" function.
Elements per symbol:	6 (3 bars, 3 spaces)
Character density:	9.1 CPI
Bar width:	0.25mm

The first character position in the *data* portion of the escape sequence must contain a "Start Character", as defined below. This Start Character defines the Code Set to be used to interpret the following *data* characters. Each Code Set has special character values defined that allow switching to a different Code Set(s) within the bar code.

Start Character	Code Set	Characters Sent To Printer	Characters Read By Scanner
87	A	20 – 5F	20 – 5F
		60 – 7F	00 – 32
88	B	20 – 7F	20 – 7F
89	C	Pairs of 30 – 39	Numeric Character Pairs 30, 30 – 39, 39 (00-99 Dec.)

All character values shown in Hexadecimal.

Special *data* characters are available for each Code Set that allow switching to a different Code Set and other special functions. These characters have values of 80-86 Hexadecimal and their functions in each Code Set are defined below.

Character Value (Hex)	Code Set A	Code Set B	Code Set C
80	FNC3	FNC3	-
81	FNC2	FNC2	-
82	Shift	Shift	-
83	Switch to Code Set C	Switch to Code Set C	-
84	Switch to Code Set B	FNC4	Switch to Code Set B
85	FNC4	Switch to Code Set A	Switch to Code Set A
86	FNC1	FNC1	FNC1

FNC 1: Reserved for EAN use.
FNC 2: Concatenate the data in this bar code with the data in the next bar code read. Not supported by all bar code readers.
FNC 3: Reset the bar code reader. Any other data in this bar code will be discarded.
FNC 4: Extended characters. The bar code reader will add 128 (80 Hex.) to each character.

Example 1: The following escape sequence will print a bar code containing "ABC123" that is 10mm high and is followed with human readable text.

Escape Sequence:	ESC	Z	2	7	80	Start B	A	B	C	1	2	3
Hexadecimal:	1B	5A	32	07	50	88	41	42	43	31	32	33

Example 2: The following escape sequence will print a bar code using numeric pairs of numeric characters containing "123456" that is 10mm high without human readable text.

Escape Sequence:	ESC	z	2	7	80	Start C	1	2	3	4	5	6
Hexadecimal:	1b	7A	32	07	50	89	31	32	33	34	35	36

Example 3: The following escape sequence will print the same data as in Example 1, "ABC123", using Code Sets that allow a mixture of alphanumeric character and numeric pairs. The bar code will be 20mm high without human readable text.

Escape Sequence:	ESC	z	2	7	160	Start A	A	B	C	1	Switch C	2	3
Hexadecimal:	1B	7A	32	07	A0	87	41	42	43	31	83	32	33

UCC/EAN-128 Specifications

Description: The UCC/EAN-128 specification is an internationally recognized format for application identifiers in code 128 bar codes. The bar code symbology is identical to Code 128. Only recognized bodies of the UCC or EAN may assign application identifiers. For more information visit www.ean-int.org and www.uc-council.org.

Character set: 256 ASCII via three Code Sets and an "Extend" function.

Elements per symbol: 6 (3 bars, 3 spaces)

Character density: 9.1 CPI

Bar width: 0.25mm

Example: The following escape sequence prints an all numeric bar code containing "1234" in an EAN-128 format that is 10mm high followed by human readable text.

Escape Sequence:	ESC	Z	2	6	80	FNC1	1	2	3	4
Hexadecimal:	1B	5A	32	06	50	86	31	32	33	34

UPC/EAN/JAN Specifications

Description: Each symbol starts with Leading Quiet Zone, followed with Left Guard Bars, Left Data Symbols, Center Bar Pattern, Right Data Symbols, Check Character, ending with Right Guard Bars and Trailing Quiet Zone. The UPC, EAN/JAN-8, EAN/JAN-13 specifications comprise an internationally recognized format for application identifiers. Unlike the UCC/EAN-128 specification, these identifiers are intended for point-of-sale applications. Only recognized bodies of the UCC and EAN may assign application identifiers. For more information visit www.ean-int.org and www.uc-council.org.

Character set: numeric - fixed length as follows:

- UPC-A – Requires 12 digits. The first 11 will be printed and the 12th will be replaced by a check digit calculated by the printer.
- UPC-E – Requires 7 digits. (The check digit will be added by the printer.)
- EAN/JAN-8 – Requires 8 digits. The first 7 will be printed and the 8th will be replaced by a check digit calculated by the printer.
- EAN/JAN-13: – Requires 13 digits. The first 12 will be printed and the 13th will be replaced by a check digit calculated by the printer.

Elements per symbol: 4 (2 bars, 2 spaces)

Character density: 14.5 CPI

Bar width: 0.25mm

Characters

Note: When specifying the bar code height that *h* represents the total height including a 1.25mm drop bar pattern printed after the barcode pattern.

Example 1: The following escape sequence will print a UPC-A bar code containing "12345678901" that is 30mm high followed by human readable text. Note that a check digit "9" is also sent, but will be ignored and recalculated by the printer.

Escape Sequence:	ESC	Z	4	12	240	1	2	3	4	5	6	7	8	9	0	1	9
Hexadecimal:	1B	5A	34	0C	F0	31	32	33	34	35	36	37	38	39	30	31	39

Example 2: The following escape sequence will print a UPC-E bar code containing "1234567" that is 30mm high followed by human readable text.

Escape Sequence:	ESC	Z	4	7	240	1	2	3	4	5	6	7
Hexadecimal:	1B	5A	34	07	F0	31	32	33	34	35	36	37

Example 3: The following escape sequence will print an EAN/JAN-8 bar code containing "1234567" that is 30mm high followed by human readable text. Note that a check digit "9" is also sent, but will be ignored and recalculated by the printer.

Escape Sequence:	ESC	Z	4	8	240	1	2	3	4	5	6	7	9
Hexadecimal:	1B	5A	34	08	F0	31	32	33	34	35	36	37	39

Example 4: The following escape sequence will print an EAN/JAN-13 bar code containing "123456789012" that is 30mm high followed by human readable text. Note that a check digit "9" is also sent, but will be ignored and recalculated by the printer.

Escape Sequence:	ESC	Z	4	13	240	1	2	3	4	5	6	7	8	9	0	1	2	9
Hexadecimal:	1B	5A	34	08	F0	31	32	33	34	35	36	37	38	39	30	31	32	39

Interleaved 2 of 5 Specifications

Description: Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone.

Character set: numeric pairs.

Elements per symbol: 10 (5 bars, 5 spaces)

Character density: 11.11 CPI

Bar width: 0.25mm

Example: The following escape sequence will print a bar code containing "123456" that is 10mm high followed by human readable text.

Escape Sequence:	ESC	Z	3	6	80	1	2	3	4	5	6
Hexadecimal:	1B	5A	33	06	50	31	32	33	34	35	36

Codabar Specifications

Description:	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone.
Character set:	0-9, $, -, :, /, ., + and the start/stop pairs of A/T, B/M, C/*, and D/E.
Elements per symbol:	7 (4 bars, 3 spaces)
Character density:	8.1 CPI
Bar width:	0.25mm

Example 1: The following escape sequence will print a bar code containing "123456", using the A/T start/stop characters, and 20mm high followed by human readable text.

Escape Sequence:	ESC	Z	5	8	160	A	1	2	3	4	5	6	T
Hexadecimal:	1B	5A	35	08	A0	41	31	32	33	34	35	36	54

Example 2: The following escape sequence will print a bar code containing "123456", using the C/* start/stop characters and 20mm high followed by human readable text.

Escape Sequence:	ESC	Z	5	8	160	C	1	2	3	4	5	6	*
Hexadecimal:	1B	5A	35	08	A0	43	31	32	33	34	35	36	2A

Graphics

The printer uses a single line thermal print head with elements spaced at 0.125mm. The MtP400 series print heads have 832 elements for a print width of 104mm. The graphic commands allow control of each one of the heating elements. After each line of graphic data, the paper is automatically advanced 0.125mm to position the paper for the next graphic line. To advance the paper by additional graphic increments without printing, refer to "Variable Size Line Feed" on page 11.

8-Bit Graphics **ESC # *h w data***

This command may be used to print any graphics pattern. The height and width of the graphic image may be specified as shown below. Each line must contain the same number of bytes (width).

The image will be printed starting from the left margin and up to the right margin. If the width specified will not fit within the margins, the right side of the image will be truncated.

Variable	Value	Description
h	$1 \le h \le 255$	Number of graphic lines in the data to follow.
w	$0 \le w \le 104$	Number of bytes per graphic line in the data to follow. Each byte contains 8 bits.
data	A line of graphic data bytes where the value of each byte is 0-255	*h* x *w* bytes per line are required.

Example 1: The following escape sequence will print a horizontal line 2mm long starting 2mm from the left margin.

Escape Sequence:	ESC	#	1	4	0	0	255	255
Hexadecimal:	1B	23	01	04	00	00	FF	FF

Example 2: The following escape sequence will print a square box 2mm x 2mm starting 2mm from the left margin, and then move the paper forward an additional 5mm.

Escape Sequence:	ESC	#	8	4	0	0	255	255
Hexadecimal	1B	23	08	04	00	00	FF	FF
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	128	1
Hexadecimal					00	00	80	01
Escape Sequence:					0	0	255	255
Hexadecimal					00	00	FF	FF
Escape Sequence:	ESC	J	40					
Hexadecimal:	1B	4A	28					

8 Bit Compressed Graphics — ESC v *h w c data [c data] [c data] …*

This command differs from the 8 Bit Graphics command described above by reducing the number of bits (bytes) that have to be sent to the printer. This allows for faster data transfer between the host computer and the printer.

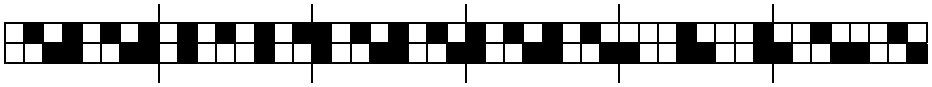
Variable	Value	Description
h	$1 \le h$ 255	Number of graphic lines in the image.
w	$0 \le w \le 104$	Number of bytes in each graphic line of the image.
c	$0 \le c \le 255$	Counter(s) describing how following bytes are to be interpreted. A description of how counter values and the following data are interpreted follows this table.
data	Graphic data bytes where the value of each byte is 0-255	Graphic data bytes to be interpreted as specified by the preceding counter, *c*.

Multiple "sets" of counters and data may be sent to the printer as necessary to describe the graphic pattern to be printed. The values specified by the counter(s) are interpreted as follows.

The counter may be considered as either a signed 7 bit value or an unsigned 8 bit value.

For signed 7 bit values:	$0 \le c \le 127$	Process the next (c + 1) bytes as simple 8 bit graphic patterns.
	$-128 \le c \le -1$	Repeat the next byte ($-c$ + 1) times.
For unsigned 8 bit values:	$0 \le c \le 127$	Process the next (c+1) bytes as simple 8 bit graphic patterns.
	$128 \le c \le 255$	Repeat the next byte (256 - c + 1) times.

Example: The following escape sequence will print a graphic image that is two lines long and six bytes (48 bits) wide as shown below. Note that the outlines for each bit are shown only to explain this example and that only the image represented by the black "bits" will actually be printed.



In the following escape sequence the data bytes are shown in binary. The hexadecimal values for each byte are shown on the second line.

ESC	v	2	6	255	01010101	255	10101010	3	00010001	00100010	00110011	01000100	25310011001
1B	76	02	06	FF	55	FF	AA	03	11	22	33	44	FD	99

Storing and Printing Graphic Images and Logos

Graphic images including logos may be stored permanently in the printer's flash memory so that they may be printed as often as needed without having to retransmit the graphic image each time. A total of 1MB of Flash memory is allocated to storing graphic images. The number of images that may be stored depends on the size of the images.

An image is programmed into the printer's memory using a series of steps, or commands, as shown below.

Step 1: Send the Load Graphic Image command to the printer.
Step 2: Send the image using up to 2,436 graphic lines as described in the Graphics section on page 16. (The 8-Bit Compress Graphics command is not supported when defining logos.)
Step 3: Send the Store Graphic Image command to the printer.
Step 4: Wait for the printer to respond with "D" (Hexadecimal 44) indicating that the printer has begun storing the image.
Step 5: Wait for the printer to respond with an Exclamation Point character ("!", Hexadecimal 21) indicating that the image has been stored.

Load Graphic Image — ESC L G *n*

This command indicates that graphic commands describing an image to be stored is to follow. The value of *n* is used to identify this particular graphic image and may be any printable ASCII character ($21 \le n \le 7E$). This same value is then used to print the graphic

The graphic data is sent using Graphic commands as described on page 16. The image may consist of up to 2,436 graphic lines. The loading process will terminate when 2,436 lines have been received, or upon receipt of the Store Graphic Image command.

Example: This escape sequence specifies that the following graphic command(s) will define graphic image "A".

Escape Sequence:	ESC	L	G	A	Graphics Data
Hexadecimal:	1B	4C	47	41	Graphic commands as described on page 16.

Note: This command may be used to store graphic images that can later be recalled and printed using O'Neil Emulation Easy Print commands. The name used in the Easy Print command would be "LOGO*n*", or "LOGOA" for the above example.

Store Graphic Image **ESC L G DEL**

This command terminates the Load Graphic Image mode and causes the graphic image to be stored in the printer's Flash memory.

After this command is received, the printer will transmit a "D" (Hexadecimal 44) and begin saving the image. Once the image is stored, the printer will transmit a an Exclamation Point ("!", Hexadecimal 21). The image may now be printed using the Print Graphic Image command.

Caution: The printer power must remain on throughout this entire process.

Escape Sequence:	ESC	L	G	DEL
Hexadecimal:	1B	4C	47	FF

Print Graphic Image **ESC L g *n***

This command will print a graphic image that was previously stored using the Load Graphic Image command.

Example: The following escape sequence will print the graphic logo stored in location zero.

Escape Sequence:	ESC	L	g	A
Hexadecimal:	1B	4C	67	41

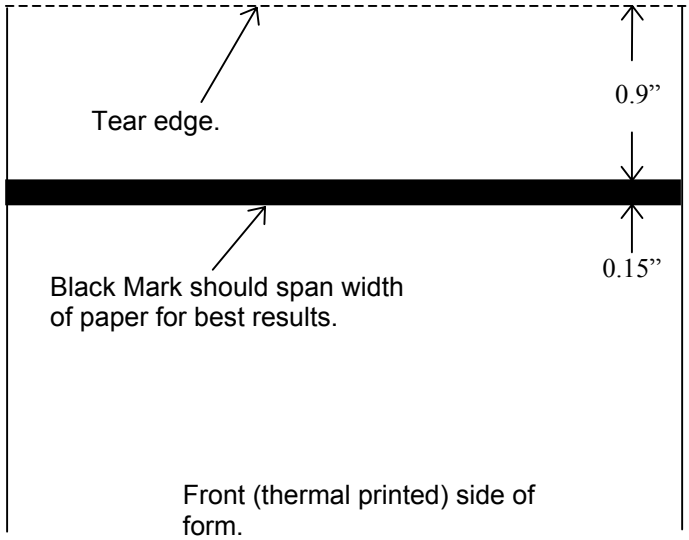
Black Mark Sensing

The MtP400 printers can print on preprinted forms on roll media by using a "black mark" to sense the beginning of each form. The black mark is located on the form in a position where the printer's paper out sensor can be used to detect its presence. Additionally, the MtP400 LP model is capable of sensing a black mark on the back side of the form and for sensing the gap between labels. The recommended position for the black mark is described below.

Black Mark Requirements

The position described below is designed to be used when seeking a Black Mark at the beginning of a print job. This position and will require little or no reverse paper motion resulting in the fastest throughput and best printing alignment, and reduces the potential for paper jams. However, the vertical position of the Black Mark is entirely dependant on the application program that is controlling the printer.

The Black Mark must be printed on the front side of the paper for MtP400 and MtP400 SL models. It may optionally be printed on the back side of the paper for MtP400 LP models. Refer to the *MtP400 Series Operator's Manual* for instructions on selecting which sensor is used.



Optimum Black Mark Position

Black Mark Sensing Commands

Set Paper Out Sensitivity — ESC Q Q *n*

This command sets the number of 0.125mm dot rows of paper motion that can occur after the paper out sensor detects the lack of paper before a paper out condition is displayed and the printer stops printing. Using this command to set a number of dot rows larger than the vertical size of the black mark, which looks like a lack of paper, allows the printer to continue operating in the area of the black mark. $0 \leq n \leq 255$, the default value is 40.

Example: The following escape sequence will set the paper out sensitivity to 50 dot rows.

Escape Sequence	ESC	Q	Q	50
Hexadecimal	1B	51	51	32

Forward Seek Black Mark — ESC Q F *n*

This command causes the printer to move the paper forward up to *n* dot rows to seek the beginning of a black mark on a form where $0 \leq n \leq 255$ 0.250mm dot rows. If the black mark is found, the printer responds with the escape sequence ESC Q ? ? *n1 n2* where *n1 n2* represent the number of dot rows the paper was moved before the black mark was detected. If the black mark is not found, the printer responds with ESC Q 0 0 *n1 n2* where *n1 n2* represent the number of dot rows moved before the seek was aborted.

Example: The following escape sequence commands the printer to move the paper forward up to 200 * 0.250 mm dot rows in search of a black mark on the form. This example also shows the printer’s response that it found the beginning of the black mark in 183 dot rows.

Command sent to printer:

Escape Sequence:	ESC	Q	F	200
Hexadecimal:	1B	51	46	C8

Response from printer:

Escape Sequence:	ESC	Q	?	?	;	7
Hexadecimal:	1B	51	3F	3F	3B	37

Note that the values for *n1 n2*, or in this example ";" "7" in the response from the printer, represent the upper and lower nibbles, respectively, of the number of dot rows the paper was moved before detecting the beginning of the black mark. Each of these values has been "or'ed" with 30 Hexadecimal in order to provide the character shown. As a result, the value represented by ";" is 176, and the value represented by "7" is 7, indicating that the paper was moved 183 dot rows, or 45.75mm.

Reverse Seek Black Mark **ESC Q B *n***

This command is identical to the Forward Seek Black Mark command described above except that the paper is moved in the reverse direction in order to seek the bottom edge of the black mark. Care should be taken not to move the paper very far in the reverse direction to avoid wrinkling the paper and creating the possibility of paper jams.

Note that reverse paper motion is not supported in MtP400 SL models and this command is ignored.

Black Mark Found (Response From Printer) **ESC Q ? ? *n1 n2***

This response is provided by the printer after detecting the presence of a black mark on the form in response to either a Forward Seek Black Mark or Reverse Seek Black Mark command. Please refer to the example for Forward Seek Black Mark, above.

Black Mark Not Found (Response From Printer) **ESC Q 0 0 *n1 n2***

This response is provided by the printer when the presence of a black mark is not detected on the form in response to either a Forward Seek Black Mark or Reverse Seek Black Mark command. Please refer to the example for Forward Seek Black Mark, above.

Gap Sensing

Gap sensing is only available on MtP400 LP models and is used to sense the space between die cut labels. The minimum space between labels is 0.125" (3.2mm).

Gap sensing is very similar to Black Mark sensing and uses the same commands. Refer to the *MtP400 Series Operator's Manual* for instructions on how to select Gap versus Black Mark sensing.

Printer Controls

Bell — BEL

Causes the printer's bell to sound.

Control code: BEL
Hexadecimal: 07

CANCEL — CAN

Deletes all data in the printer's input buffer and resets the printer to power up default values. Refer to "Printer Reset Conditions" on page 47 for more information.

Control Code: CAN
Hexadecimal: 18

Reset — ESC c

Deletes all data in the printer's input buffer and resets the printer to power up default values. Refer to "Printer Reset Conditions" on page 47 for more information.

Escape Sequence: ESC c
Hexadecimal: 1B 63

Print Contrast — ESC P *n*

Sets the contrast, or relative "darkness", of the characters or graphic images to be printed where $0 \leq n \leq 9$ (hexadecimal 30-39). A value of zero provides the greatest contrast and also the slowest print speed. Likewise, a value of nine provides the lowest contrast, but the fastest print speed. The default value is "5".

Since contrast is greatly affected by the quality of thermal paper being used, this command allows varying grades of paper to be printed on successfully.

In association with this setting, the printer automatically adjusts the contrast while printing in order to achieve consistent output based on the current battery condition and print head temperature.

Example: The following escape sequence with set the printer to a Print Contrast setting of "4".

Escape Sequence: ESC P 4
Hexadecimal: 1B 50 34

Buffer Mode

ESC P #
ESC P $

Buffer Mode may be used to force the printer to "hold" data until the entire print job is received.

If Buffer Mode has been enabled, the printer continues to hold data in its input buffer until an EOT character (Hexadecimal 04) has been received. Once the EOT is received, the printer will print the data in the input buffer up to the EOT character.

When Buffer Mode is not enabled (default) data are printed as received.

Example 1: The following escape sequence enables Buffer Mode.

Escape Sequence:	ESC	P	$
Hexadecimal:	1B	4D	24

Example 2: This escape sequence disables Buffer Mode.

Escape Sequence:	ESC	P	#
Hexadecimal:	1B	4D	23

Select Format

ESC l *n*

Causes the current line to be printed, and then loads the format parameters for Format *n*. $1 \geq n \geq 5$. If Format *n* is already selected, this command is ignored. Refer to the Printer Configuration section of the *MtP400 Series Operator's Manual* for complete details.

Example: This escape sequence selects Format 2.

Escape Sequence:	ESC	l	2
Hexadecimal:	1B	6C	02

Select Emulation

ESC ESC *n*

Select the printer emulation mode to be used for future commands. For complete details, refer to "Selecting Emulations" on page 3.

Printer Status Commands

Print Battery Status

ESC P ^

This command will cause the printer to print the current battery voltage and charge status followed by a Carriage Return and Line Feed.

If a partial line exists in the buffer, it will be printed prior to printing the battery information.

Escape Sequence:	ESC	P	^
Hexadecimal:	1B	50	5E

Query Printer Status

STX
SYN

Each of these commands returns character strings which provide information regarding the current print buffer status and the magnetic card reader status. Additionally, SYN will return the current battery voltage.

Each status is returned as an escape sequence and four ASCII hexadecimal digits followed by a Carriage Return and Line Feed. The hexadecimal digits are nibbles that have been "OR'ed" with 0x30. The statuses returned for each command are as follows:

Command	Returned Strings	Comment
STX	ESC B *b1 b2 b3 b4* CR LF	Print Buffer Status
	ESC M *m s1 s2 t* CR LF	MCR Status
SYN	ESC B *b1 b2 b3 b4* CR LF	Print Buffer Status
	ESC M *m s1 s2 t* CR LF	MCR Status
	ESC V *v1 v2 v3 v4* CR LF	Battery Voltage Status

Print Buffer Status String

The print buffer status will be retuned as a four digits representing the number bytes in the buffer that remain to be processed, divided by 32. For example, if *b1-b4* = "0020", this would indicate that there are 20 x 32, or 640 bytes remaining to be processed. A value of "0000" would indicate that the buffer is empty.

Magnetic Card Reader Status String

The MCR status indicates the presence of a reader in the printer, and if present, its current status.

m "0" if MCR is present. "X" if not installed in printer.

s1, s2 Number of seconds remaining for a good card swipe before the timeout specified in the read command occurs. If this value is "00" and a non-zero value for *t* is returned, the reader will not time out and must be cancelled by a Cancel Read Magnetic Card Reader command.

t The tracks to be read as specified by the read command. If this value is zero and *m* and *s1, s2* are also zero, this indicates that the reader is present but currently disabled (no read pending).

Battery Voltage Status String

This string contains the current battery voltage in millivolts. A string where v1 through v4 contains "7123" would indicate that the battery voltage is currently 7123 millivolts, or 7.123 volts.

Example: The following control code will return the status of the print buffer, the magnetic card reader, and the battery voltage.

Control Code:	SYN
Hexadecimal:	16

The three sample status strings that would be returned in response to this command are as follows.

Print Buffer Status:	ESC	B	0	0	4	2	CR	LF	1,344 bytes in input buffer.
Hexadecimal:	1B	42	30	30	34	32	0D	0A	
MCR Status:	ESC	M	0	1	2	4	CR	LF	Twelve seconds remain to read 1 & 2.
Hexadecimal:	1B	4D	30	31	32	34	0D	0A	
Battery Voltage:	ESC	V	7	1	2	3	CR	LF	Battery Voltage is 7.123 Volts
Hexadecimal:	1B	56	37	31	32	33	0D	0A	

Query Printer Firmware Version — ESC P (

This command returns a string containing the printer's firmware version designation as three ASCII digits. The three digits may be interpreted by adding a decimal point between the first two digits as shown in the example below.

Example: This following escape sequence requests the printer's firmware version.

Escape Sequence:	ESC	P	(
Hexadecimal:	1B	50	28

A sample string returned in response to this command is shown below and indicates that the firmware version is "1.00".

Firmware Version:	ESC	(	1	0	0	SPACE	CR	LF
Hexadecimal:	1B	28	31	30	30	20	0D	0A

Query Printer Model and Hardware Revision Level — ESC P)

This command returns a string containing three digits that represent the printer model and a single character that represents the printer's hardware revision level. The printer models indicated by the three digits are as follows:

Model String	Printer Model Indicated
400	MtP400
401	MtP400 SL
402	MtP400 with MCR
403	MtP400 SL with MCR
404	MtP400 LP
406	MtP400 LP with MCR

Example: This escape sequence requests the printer's model and revision level.

Escape Sequence:		ESC P	)
Hexadecimal:	1B	50	29

A sample string returned in response to this command is shown below and indicates that the printer is a model is an MtP400 SL with a Magnetic Card Reader, and is at hardware revision level "A".

Printer/Version:	ESC	)	4	0	3	A	CR	LF
Hexadecimal:	1B	29	34	30	33	41	0D	0A

Magnetic Card Reader

Read Magnetic Card Data — ESC M *n1 n2 t* CR

If the optional Magnetic Card Reader (MCR) is installed in the printer, this command instructs the printer to read data from a card such as a credit card or driver's license. The MCR is a three track reader designed to read magnetically encoded data conforming to ANSI/ISO 7810, 7811 standards. The card specifications are listed below.

	Track 1 ISO1 (IATA)	Track 2 ISO2 (ABA)	Track 3 ISO3 (MINTS)
Recording Density	210 bpi	75 bpi	210 bpi
Data Bits	7	5	7
Characters Per Track	79	40	107
Card Thickness	0.030" ±0.003" (0.76mm ±0.08mm)		

The Read Magnetic Card Data command to allows an application to request that the MCR reads one, two, or three tracks simultaneously within a specified number of seconds, where *n1 n2* are ASCII digits that specify the number of seconds to wait for the user to successfully swipe a card before a "timeout" error occurs, and *t* is an ASCII digit specifying the tracks to be read.

Specifying a timeout value of "00" disables the timeout timer and allows the user to swipe a card until a successful read is accomplished or until a cancel command (ESC C) is sent by the host.

t	**Tracks To Be Read**
1	Track 1
2	Track 2
3	Track 3
4	Tracks 1 & 2
5	Tracks 2 & 3
6	Tracks 1, 2 & 3

After the printer receives the command, the ▭ MCR indicator will begin to flash indicating to the user that (s)he may now pass the card to be read through the MCR slot near the front of the printer. The card may be swiped

in either direction. If the read is successful, the ▭ MCR indicator will stay lit momentarily (not flashing) and the printer will transmit the data read and/or the status of the requested read operation.

If a swipe does not result in a successful read, the ⚠ Error Indicator will also begin to flash and an error message as described below will be transmitted. The card may be swiped multiple times until a successful read occurs or until the specified timeout expires. Once the timeout occurs, the MCR will be disabled and both indicators will be turned off.

The data are returned as string(s) of ASCII characters in the following format.

ASCII:	%	/	1	/	*track 1 data*	?	CR	LF
Hexadecimal:	25	2F	31	2F	…	3F	0D	0A
ASCII:	;	/	2	/	*track 2 data*	?	CR	LF
Hexadecimal:	3B	2F	32	2F	…	3F	0D	0A
ASCII:	+	/	3	/	*track 3 data*	?	CR	LF
Hexadecimal:	2B	2F	33	2F	…	3F	0D	0A

Note: If no data is available for a track, the *track data* portion of the string will be empty. Other tracks containing valid data will be returned. If an error occurs on any track, the *track data* portion of the string for that track will contain a single "E" (Hexadecimal 45).

If for any reason the MCR is unable to read the card's data, the printer will transmit an error message string in the format shown below. The characters *n1 n2* represent an error number and *error message* is a description of the error. Possible values are described in the subsequent table.

ASCII:	%	E	,	*n1*	*n2*	,	*error message*	,	CR	LF
Hexadecimal:	25	45	2C	…	…	2C	…	2C	0D	0A

n1 n2	**Error Message**
05	Time-out Expired
07	Invalid Track Number
08	Unsupported Track Selected
09	Cancel Request

Cancel Read Magnetic Card Data Command — ESC C

This command will cancel a pending MCR read command. The printer will transmit an "error" message indicating that it has processed the cancel request and turn off the MCR indicator.

Escape Sequence:	ESC	C
Hexadecimal:	1B	43

Control Code and Escape Sequence Summary

Communications (RS-232C Serial Interface Only)	
End of Text	ETX
Acknowledge (Transmitted by Printer)	ACK
Printer Idle (Transmitted by Printer)	EOT
Transmitter On (Transmitted by Printer)	XON (DC1)
Transmitter Off (Transmitted by Printer)	XOFF (DC3)
Character Size and Line Spacing	
Select Character Pitch	ESC K *n*
Set Printer to 12.7 cpi	SO
Set Printer to 22.6 cpi	SI
Set Printer to 22.6 cpi	NORM (DC4)
Double High On	FS
Double High Off	GS
Set Text Line Spacing	ESC a *n*
Character Attributes	
Select Emphasized Mode	ESC U *n*
Character Sets	
Select Extended Character Set	ESC F *n*
Horizontal Position	
Carriage Return	CR
Backspace	BS
Horizontal Tab	HT
Vertical Position	
Line Feed	LF
Variable Size Line Feed	ESC J *n*
Variable Size Reverse Line Feed	ESC Q J *n*
Vertical Tab	VT
Form Feed	FF
Bar Codes	
Print Bar Code	ESC z *t n h data*
Print Bar Code With Human Readable Text	ESC Z *t n h data*
Graphics	
8-Bit Graphics	ESC # *h w data*
8 Bit Compressed Graphics	ESC v *h w c data [c data] [c data]* …
Storing and Printing Graphic Logos	
Load Graphic Logo	ESC L G *n*
Store Graphic Logo	ESC L G DEL
Print Graphic Logo	ESC L g *n*

Black Mark Sensing

Set Paper Out Sensitivity	ESC Q Q *n*
Forward Seek Black Mark	ESC Q F *n*
Reverse Seek Black Mark	ESC Q B *n*

Printer Controls

Sound Bell	BEL
Cancel	CAN
Reset Printer	ESC c
Print Contrast	ESC P *n*
Enable Buffer Mode	ESC P #
Disable Buffer Mode	ESC P $
Print Buffer Contents (Buffer Mode)	EOT
Select Format	ESC l *n*
Select Emulation	ESC ESC *n*

Printer Status Commands

Print Battery Status	ESC P ^
Query Print Buffer & MCR Status	STX
Query Print Buffer, MCR, & Battery Voltage Status	SYN
Query Printer Firmware Version	ESC P (
Query Printer Model and Hardware Revision Level	ESC P)

Magnetic Card Reader

Read Magnetic Card Data	ESC M *n1 n2 t* CR
Cancel Magnetic Card Data Read Command	ESC C

Mt3 Emulation

Selecting Mt3 Emulation allows applications written for the Printek Mt3 series printers to operate properly when printing to an MtP400. When in this emulation, the printer matches the print width of the Printek Mt3 by only allowing printing to occur on the leftmost 2.83 inches (576 dots) of the print line.

For information on selecting emulations using Escape Sequences, please refer to "Selecting Emulations" on page 3. For information selecting emulations through the printer's control panel set up, please refer to the *MtP400 Series Operator's Manual*.

The following summary lists the commands supported when Mt3 Emulation is selected. For more detailed information, please refer to the *Mt3 Programmer's Manual*.

Communications (RS-232C Serial Interface Only)

End of Text	ETX
Acknowledge (Transmitted by Printer)	ACK
Printer Idle (Transmitted by Printer)	EOT
Transmitter On (Transmitted by Printer)	XON (DC1)
Transmitter Off (Transmitted by Printer)	XOFF (DC3)

Character Size and Line Spacing

Select Character Pitch	ESC k *n*
Set Printer to 12 cpi	SO
Set Printer to 21 cpi	SI
Set Printer to 21 cpi	NORM (DC4)
Double High On	FS
Double High Off	GS
Set Text Line Spacing	ESC a *n*

Character Attributes

Select Emphasized Mode	ESC U *n*

Character Sets

Select Extended Character Set	ESC F *n*

Horizontal Position

Carriage Return	CR
Backspace	BS
Horizontal Tab	HT

Vertical Position

Line Feed	LF
Variable Size Line Feed	ESC J *n*
Variable Size Reverse Line Feed	ESC Q J *n*
Vertical Tab	VT
Form Feed	FF

Bar Codes

Print Bar Code	ESC z *t n h data*
Print Bar Code With Human Readable Text	ESC Z *t n h data*

Graphics

8-Bit Graphics	ESC V *n1 n2 data*
8 Bit Compressed Graphics	ESC v *h w c data [c data] [c data]* …

Storing and Printing Graphic Logos

Enter Flash Logo Mode	ESC D L
Load Graphic Logo	ESC L G 0
Store Graphic Logo	ESC L G DEL
Print Graphic Logo	ESC L g 0

Black Mark Sensing

Set Paper Out Sensitivity	ESC Q Q *n*
Forward Seek Black Mark	ESC Q F *n*
Reverse Seek Black Mark	ESC Q B *n*

Printer Controls

Cancel	CAN
Print Contrast	ESC P *n*
Peak Power Mode	ESC P *n*
Enable Buffer Mode	ESC P #
Disable Buffer Mode	ESC P $
Print Buffer Contents (Buffer Mode)	EOT
Select Emulation	ESC ESC *n*

Printer Status Commands

Print Battery Status	ESC P ^
Query Print Buffer & MCR Status	STX
Query Print Buffer, MCR, & Battery Voltage Status	SYN
Query Printer Firmware Version	ESC P (
Query Printer Model and Hardware Revision Level	ESC P)

Magnetic Card Reader

Read Magnetic Card Data	ESC M *n1 n2 t* CR
Cancel Magnetic Card Data Read Command	ESC C

O'Neil Emulation

O'Neil Emulation allows the Printek MtP400 series printers to respond to commands designed to operate an O'Neil microFlash4t printer. The commands that are supported are listed below.

Communications

Same as Printek Emulation

Line Printer Mode

Character Size and Line Spacing

Select Double Wide	SO
Cancel Double Wide	SI
Multiply Character Height	ESC H *n*
Select Double High and Double Wide	ESC ! *n*

Character Sets

Select Font	ESC w *n*

Horizontal Position

Carriage Return	CR

Vertical Position

Line Feed	LF
Form Feed	FF
Set Interline Spacing	ESC A *n*
Set Form Length	ESC C *n*
Advance From Q Mark	ESC Q *n1 n2*

Graphics

Select Graphics Mode	ESC V *n1 n2*
Begin Graphics	ESC B
End Graphics	ESC E

Printer Controls

Cancel Line Buffer	CAN
Reset	ESC @
Select Easy Print Mode	ESC E Z

Easy Print Mode

Move Paper Forward	{AHEAD:*n*}	
Move Paper Backward	{BACK:*n*}	
Select Line Printer Mode	{LP}	
Print Test Page	{TP}	
Save Graphic	{SAVE:*n*}	This command has been added to provide a mechanism for storing graphic images. The image defined in the PRINT command that immediately follows will be stored as a graphic named "*n*".

Print Text Line/Bar Code/Graphic Image/Line

{PRINT,*GlobalOptions*:@*row*,*column*:*name*,*FieldOptions*|*data*|}

GlobalOptions: BACK, DEMAND, QUANTITY, QSTOP, STOP, ROT270

FieldOptions: Fonts – HMULT*n* (HM*n*), VMULT*n* (VM*n*)
Bar Codes – HIGH*n* (H*n*), WIDE*n* (W*n*)
Graphics – HMULT*n* (HM*n*), VMULT*n* (VM*n*)
Lines – length *n* (L*n*), thick *n* (T*n*)

Line Printer and Easy Print Modes

Query Commands

Print Status Request	ESC{ST?}
Configuration Request	ESC{CF?}
Battery Condition Request	ESC{BT?}
Version Request	ESC{VR?}
Memory Information/Status Request	ESC{MY?}
Print Head Information Request	ESC{PH?}
IrDA Configuration Information Request	ESC{IR?}
Font List Request	ESC{FN?}
Graphic List Request	ESC{GR?}
Format List Request	ESC{FM?}
Demand Quantity Remaining Request	ESC{DQ?}
Cancel Demand Printing	ESC{CN!}
Reset Printer	ESC{RE!}

Magnetic Card Reader Commands

Configure Reader	ESC{CCR:n}
Configure MCR	ESC{CMR:n}
Enable MCR	ESC{ME!}
Disable MCR	ESC{MD!}
Zero MCR Data	ESC{MZ!}
Read MCR Status	ESC{RS?}
Read MCR Data	ESC{MR?}

Printer Controls

Select Emulation	ESC ESC *n*

Font Mapping

Line Printer Mode	Easy Print Mode	Font Used
0x20	MF102	10.2 cpi Sans Serif A
0x21	MF204	20.3 cpi Courier
0x22	MF072	10.2 cpi Sans Serif A
0x23	MF055	5.5 cpi Sans Serif A
0x24	MF185	18.5 cpi Courier
0x25	MF226	22.6 cpi Courier
0x26	MF107	10.7 cpi Sans Serif A
*	*	15.6 cpi Courier

* All other font specifications.

ZPL-II Emulation

ZPL-II Emulation supports a subset of the Zebra ZPL-II command set and allows the Printek MtP400 series printers to respond to commands designed to control a ZPL-II compatible printer. The commands that are supported are listed below.

Select Font For Current Field	^A *n1,n2,n3,n4*	
Interleaved 2 of 5 Bar Code	^B2 *n1,n2,n3,n4,n5*	
Code 39 Bar Code	^B3 *n1,n2,n3,n4,n5*	
PDF417 Bar Code	^B7 *n1,n2,n3,n4,n5,n6*	
EAN-8 Bar Code	^B8 *n1,n2,n3,n4*	
UPC-E Bar Code	^B9 *n1,n2,n3,n4,n5*	
Code 128 (A, B, C) Bar Code	^BC *n1,n2,n3,n4,n5,n6*	
EAN-13 Bar Code	^BE *n1,n2,n3,n4*	
ANSI Codabar Bar Code	^BK *n1,n2,n3,n4,n5,n6,n7*	
UPC-A Bar Code	^BU *n1,n2,n3,n4,n5*	
Bar Code Field Default	^BY *n1,n2,n3*	
Download Format	^DF *n1:n2.n3*	
Field Data	^FD *n*	
Field Number	^FN *n*	
Field Origin	^FO *n1,n2*	
Field Separator	^FS or SI	
Graphic Box	^GB *n1,n2,n3,n4,n5*	
Change Backfeed Sequence to Normal	~JSN	
Set 230 Dots Per Inch	^JMA	
Reprint After Error = Yes	^JZY	
Label Home	^LH *n1,n2*	
Label Reverse Print = No	^LRN	
Label Top	^LT *n*	
Map Clear = Yes	^MCY	
Print Mirror Image = No	^PMN	
Print Quality	^PQ *n1,n2,n3,n4*	
Print Rate = Maximum	^PR4,4	
Select ZPL-II	^SZ2	
Media Feed	^MF *n1,n2*	^MFN,N
Start Format	^XA or STX	
Recall Format	^XF *n1,n2,n3*	
End Format	^XZ or ETX	

Additional Printer Control

Select Emulation	ESC ESC *n*

Bar Code and Font Indices

Bar Code	Index
Interleaved 2 of 5	2
Code 39	3
PDF417	7
EAN-8	8
UPC-E	9
Code 128	C
EAN-13	E
Codabar (ANSI)	K
UPC-A	U

Font Requested	Index	Font Used
Zebra Font A	A	25.4 cpi Courier
Zebra Font B	B	22.6 cpi Courier
Zebra Font C	C	18.5 cpi Courier
Zebra Font D	D	18.5 cpi Courier
Zebra Font E	E	10.2 cpi Sans Serif A
Zebra Font F	F	5.5 cpi Sans Serif A
Zebra Font G	G	10.7 cpi Sans Serif A

Hex Dump Mode

Hex Dump provides a way to print, in a readable form, all the data received by the printer. This tool is useful to programmers for debugging programs when sending control codes and escape sequences to the printer. Hex Dump mode may also be used to detect what commands are being sent by a particular software application to help determine which emulation mode is needed for that application.

When the printer is operating in Hex Dump mode, control characters and escape sequences sent to the printer are not recognized or processed. The hexadecimal representation of the control characters and escape sequences will appear in the hex dump, but no other special processing will occur.

To select Hex Dump mode, enter Setup and use the ▶ Advance Button to select the "INTERFACE MENU". Next use the ↵ Enter Button to select "Emulation" and then use the ✚ Increment Button to select "Hex Dump". Now press the ▶ Advance Button Until "Exit Setup, Save Changes" is displayed and press the ↵ Enter Button. The printer will now reset and remain in Hex Dump mode until the "Emulation" is set back to another appropriate value.

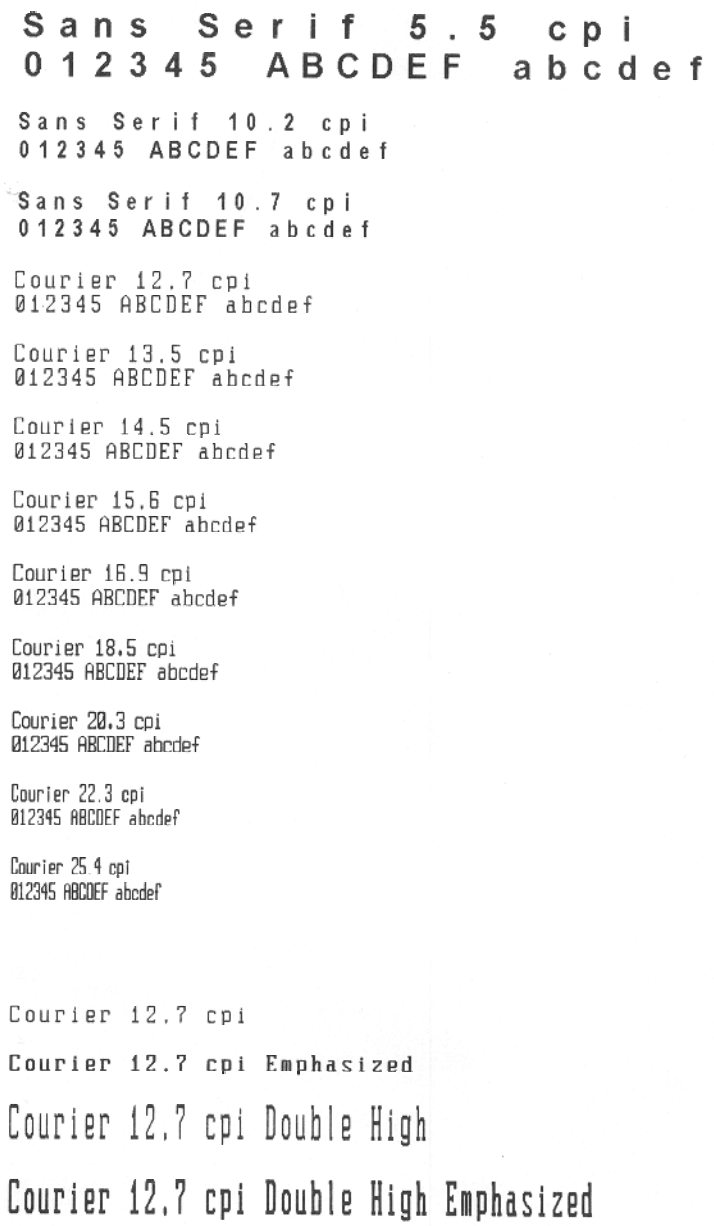
A sample hex dump is shown below. Note that each line shows eight characters, first in hexadecimal format, then in printable ASCII format. All unprintable ASCII characters (0x00-0x1F) are represented by a period.

```
54686973 20697320    This.is.
61207361 6D706C65    a.sample
20686578 2064756D    .hex.dum
7020746F 20696C6C    p.to.ill
75737472 61746520    ustrate.
68657820 64756D70    hex.dump
666F726D 61740D0A    format..
```

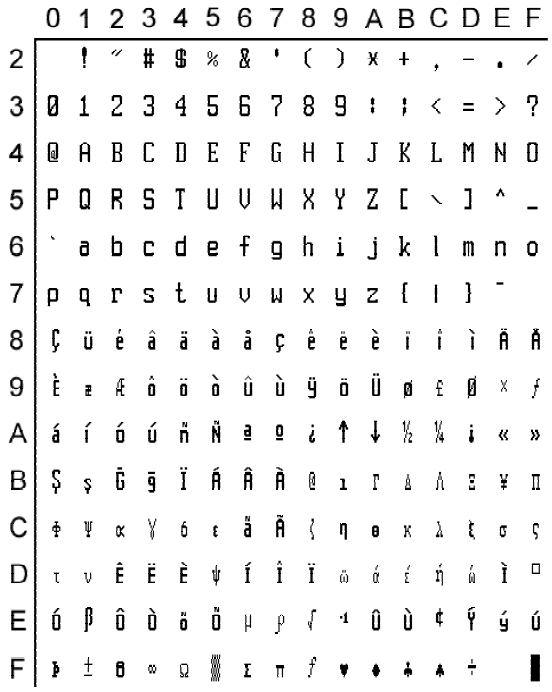
Note: ETX/ACK handshake will not operate properly in Hex Dump mode. When an ETX is received by the printer, its hexadecimal representation will be printed in the hex dump, but no ACK will be sent to the host computer. When using the printer in Hex Dump mode using the RS-232C Serial Interface, it is recommended that the printer be configured for RTS/CTS handshake or XON/XOFF handshake.

Print & Font Samples

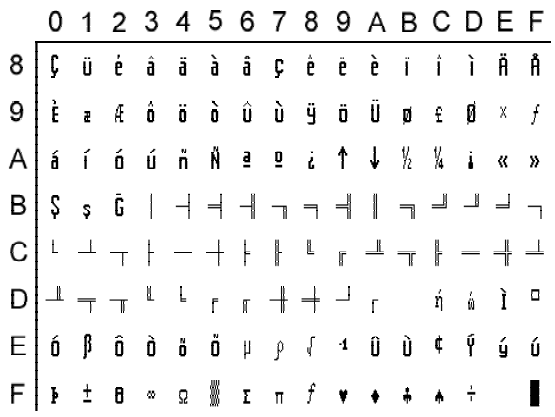
Print Samples



Courier Font With International Extended Character Set


0 1 2 3 4 5 6 7 8 9 A B C D E F
2 ! " # $ % & ' ( ) * + , - . /
3 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
4 @ A B C D E F G H I J K L M N O
5 P Q R S T U V W X Y Z [\ ] ^ _
6 ` a b c d e f g h i j k l m n o
7 p q r s t u v w x y z { | } ~
8 Ç ü é â ä à å ç ê ë è ï î ì Ä Å
9 É æ Æ ô ö ò û ù ÿ ö Ü ø £ Ø × ƒ
A á í ó ú ñ Ñ ª º ¿ ↑ ↓ ½ ¼ ¡ « »
B Ş ş Ğ ğ İ Á Â À © ı Γ Δ Λ Ξ ¥ Π
C ф Ψ α ¥ ó ε å Ã ξ η ϑ κ λ ξ σ ς
D τ υ Ê Ë È ψ Í Î Ï ώ ά έ ή ΰ Ì □
E Ó ß Ô Ò ö Õ μ ρ √ ⁻¹ Û Ù ¢ Ý ý Ú
F ÞÞ ± ϑ ∞ Ω ▒ Σ π ƒ ♥ ♦ ♣ ♠ ÷ ▌

Courier Font PC Line Drawing Extended Character Set



Sans Serif Font

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	□
8	€	□	‚	ƒ	„	…	†	‡	ˆ	‰	Š	‹	Œ	□	Ž	□
9	□	‘	’	“	”	•	–	—	˜	™	š	›	œ	□	ž	Ÿ
A		¡	¢	£	¤	¥	¦	§	¨	©	ª	«	¬	-	®	¯
B	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
C	À	Á	Ã	Ã	Ä	Å	Æ	Ç	È	É	Ë	Ë	Ì	Í	Î	Ï
D	Ð	Ñ	Ò	Ó	Ö	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
F	ð	ñ	ò	ó	ô	ő	ö	÷	ø	ù	ú	û	ü	ý	þ	

ASCII Character Tables

ASCII Control Code Definitions

The following table is provided as a reference to the control character descriptions as provided by the ASCII definition. Not all of these definitions are supported by the Printek MtP series printers and some are emulation dependent. For more information consult the appropriate chapter for the emulation being used.

Control Code	Hexadecimal Value	Description
NUL	00	Null
SOH	01	Start of Heading
STX	02	Start of Text
ETX	03	End of Text
EOT	04	End of Transmission
ENQ	05	Enquiry
ACK	06	Acknowledge
BEL	07	Bell
BS	08	Backspace
HT	09	Horizontal Tabulation
LF	0A	Line Feed
VT	0B	Vertical Tabulation
FF	0C	Form Feed
CR	0D	Carriage Return
SO	0E	Shift Out
SI	0F	Shift In
DLE	10	Data Link Escape
DC1	11	Device Control 1 (XON)
DC2	12	Device Control 2
DC3	13	Device Control 3 (XOFF)
DC4	14	Device Control 4
NAK	15	Negative Acknowledge
SYN	16	Synchronous Idle
ETB	17	End of Transmission Block
CAN	18	Cancel
EM	19	End of Medium
SUB	1A	Substitute
ESC	1B	Escape
FS	1C	File Separator
GS	1D	Group Separator
RS	1E	Record Separator
US	1F	Unit Separator

Decimal to Hexadecimal TO ASCII Conversion Table

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	Dec	Hex
0	00	NUL	64	40	@	128	80	192	C0
1	01	SOH	65	41	A	129	81	193	C1
2	02	STX	66	42	B	130	82	194	C2
3	03	ETX	67	43	C	131	83	195	C3
4	04	EOT	68	44	D	132	84	196	C4
5	05	ENQ	69	45	E	133	85	197	C5
6	06	ACK	70	46	F	134	86	198	C6
7	07	BEL	71	47	G	135	87	199	C7
8	08	BS	72	48	H	136	88	200	C8
9	09	HT	73	49	I	137	89	201	C9
10	0A	LF	74	4A	J	138	8A	202	CA
11	0B	VT	75	4B	K	139	8B	203	CB
12	0C	FF	76	4C	L	140	8C	204	CC
13	0D	CR	77	4D	M	141	8D	205	CD
14	0E	SO	78	4E	N	142	8E	206	CE
15	0F	SI	79	4F	O	143	8F	207	CF
16	10	DLE	80	50	P	144	90	208	D0
17	11	XON	81	51	Q	145	91	209	D1
18	12	DC2	82	52	R	146	92	210	D2
19	13	XOFF	83	53	S	147	93	211	D3
20	14	DC4	84	54	T	148	94	212	D4
21	15	NAK	85	55	U	149	95	213	D5
22	16	SYN	86	56	V	150	96	214	D6
23	17	ETB	87	57	W	151	97	215	D7
24	18	CAN	88	58	X	152	98	216	D8
25	19	EM	89	59	Y	153	99	217	D9
26	1A	SUB	90	5A	Z	154	9A	218	DA
27	1B	ESC	91	5B	[	155	9B	219	DB
28	1C	FS	92	5C	\	156	9C	220	DC
29	1D	GS	93	5D	]	157	9D	221	DD
30	1E	RS	94	5E	^	158	9E	222	DE
31	1F	US	95	5F	_	159	9F	223	DF
32	20	SP	96	60	`	160	A0	224	E0
33	21	!	97	61	a	161	A1	225	E1
34	22	“	98	62	b	162	A2	226	E2
35	23	#	99	63	c	163	A3	227	E3
36	24	$	100	64	d	164	A4	228	E4
37	25	%	101	65	e	165	A5	229	E5
38	26	&	102	66	f	166	A6	230	E6
39	27	'	103	67	g	167	A7	231	E7
40	28	(	104	68	h	168	A8	232	E8
41	29	)	105	69	i	169	A9	233	E9
42	2A	*	106	6A	j	170	AA	234	EA
43	2B	+	107	6B	k	171	AB	235	EB
44	2C	,	108	6C	l	172	AC	236	EC
45	2D	-	109	6D	m	173	AD	237	ED
46	2E	.	110	6E	n	174	AE	238	EE
47	2F	/	111	6F	o	175	AF	239	EF
48	30	0	112	70	p	176	B0	240	F0
49	31	1	113	71	q	177	B1	241	F1
50	32	2	114	72	r	178	B2	242	F2
51	33	3	115	73	s	179	B3	243	F3
52	34	4	116	74	t	180	B4	244	F4
53	35	5	117	75	u	181	B5	245	F5
54	36	6	118	76	v	182	B6	246	F6
55	37	7	119	77	w	183	B7	247	F7
56	38	8	120	78	x	184	B8	248	F8
57	39	9	121	79	y	185	B9	249	F9
58	3A	:	122	7A	z	186	BA	250	FA
59	3B	;	123	7B	{	187	BB	251	FB
60	3C	<	124	7C	|	188	BC	252	FC
61	3D	=	125	7D	}	189	BD	253	FD
62	3E	>	126	7E	~	190	BE	254	FE
63	3F	?	127	7F	DEL	191	BF	255	FF

Printer Reset Conditions

The following list describes what conditions are assumed whenever the printer is powered on, the Setup Menus are exited, or a reset escape sequence is received when the printer is operating in an emulation mode which supports such a sequence.

This list includes all variables which may be modified by the user for all emulations even though some emulations cannot modify all the variables shown. Refer to the appropriate section for the emulation being used.

Variable	Reset Condition
Emulation	According to Interface Setup
Line Printer/Easy Print	Line Printer Mode
Character Pitch/Font	According to Format Setup
Extended Character Set	International
Double High	Off
Double Wide	Off
Emphasized	Off
Line Spacing	According to Format Setup
Left Margin	According to Format Setup
Right Margin	According to Format Setup
Print Contrast	According to Format Setup
Buffer Mode	Disabled
Text in an Incomplete Line	Discarded
Input Buffer	Cleared (unless reset from host)
Magnetic Card Reader	Pending Read Canceled

Glossary

802.11	Wireless networking communication standards created by IEEE.
access point	An interface between a wireless network and a wired network.
Ad-Hoc	A Wi-Fi network consisting of only stations (no access point). Same as Peer-to-Peer.
ASCII	American Standard Code for Information Interchange.
authentication	The process a Wi-Fi station uses to identify itself to another station.
bandwidth	The amount of data that be transferred in a given period of time.
baud rate	The rate at which characters are transmitted over a serial interface. This is also often referred to as bits per second.
binary	Base two numbering system. Digits are represented by the characters 0 and 1.
bit	A single binary digit.
Bluetooth	A definition for short range radio frequency communications.
client	Any node on a network that requests services from another node (server).
control code	A single, non-printing character which is used to control the configuration or operation of the printer.
character pitch	The horizontal spacing of characters. Measured in cpi.
cpi	Characters per inch.
current line	The line upon which the next character will be printed.
current print position	The column on the current line where the next character will be printed.
default	Value or configuration assumed when the printer is powered on or reset.
DHCP	Dynamic Host Configuration Protocol. A method used to centrally control the assignment of IP addresses on a network.
dpi	Dots per inch. Generally used to refer to graphics density or resolution.
escape sequence	String of characters beginning with the escape (ESC) character which is used to control the configuration or operation of the printer. The characters which are part of this string are not printed.
font	A group of characters of a given shape or style.
hexadecimal	Base sixteen numbering system. Digits are represented by the characters 0 through 9 and a through f.
IEEE	Institute of Electrical and Electronic Engineers
infrastructure	A Wi-Fi network consisting of stations connecting to a wired network or other stations via an access point.
interface	The connection between the printer and the host computer.

IP	Internet Protocol. A specification for packets, or datagrams, of data and an addressing method to allow the exchange of data with another system. Must be combined with another protocol such as TCP to create a complete connection with the other system.
LAN	Local Area Network.
LCD	Liquid crystal display.
LED	Light emitting diode.
line pitch	The vertical spacing of rows of characters. Measured in lpi.
lpi	Lines per inch.
margin	An area along any edge of a form where data may not be printed.
MSB	Most significant bit. In a character, this refers to bit seven (of 0 to 7).
node	Any device connected to a network.
parity	A method used for detecting errors within a single character transmitted or received via an interface.
Peer-to-Peer	A network consisting of only stations (no access point or central server). Same as Ad-Hoc.
reset	Initialization of various operating parameters of the printer to the value or state assumed when the printer is powered on.
RS-232C	An EIA standard for serial data transmission.
server	Any node on a network that provides services to another node (client).
SSID	Service Set IDentifier. An identifier attached to packets on a Wi-Fi network that identify the particular network the packets are intended for.
TCP	Transmission Control Protocol. A specification that controls the connection between systems on a network.
top of form	The vertical position where the first line is printed on the paper. Also the position the paper is advanced to when a form feed (FF) character is received from the host or the Form Feed button is pressed on the printer's control panel.
WAN	Wide Area Network. Refers to connections that allow one LAN to communicate with another LAN(s).
WEP	Wired Equivalent Privacy. A security protocol for wireless LANs designed to provide data security similar a wired LAN.
Wi-Fi	Refers to any of the IEEE 802.11 standards.
WLAN	Wireless Local Area Network. A LAN made up of wireless nodes.